DATE: March 16, 2000

TO: OWP Staff

THROUGH: E. H. Bartsch, P.E., Director, Office of Water Programs

THROUGH: Robert B. Taylor, P.E., Director, Division of Water Supply Engineering

FROM: M/DBP Team

SUBJECT: Water – Procedures – Enforcement – IESWTR – Disinfection Profiling and Benchmarking

Delete Working Memo Number 809

The Interim Enhanced Surface Water Treatment Rule (IESWTR) issued by the USEPA on December 16, 1998 applies to waterworks that use surface water or groundwater under the direct influence of surface water and serve 10,000 or more people. The M/DBP Team is still working to incorporate the IESWTR into the *Waterworks Regulations* and Virginia has not received primacy to enforce this Rule. Due to the timing of the Disinfection Profiling and Benchmarking required in the IESWTR, OWP needs to assist waterworks owners in meeting these requirements. An attempt has been made to provide as much information as possible in this document. However, this document is a summary of the requirements found in the following documents:

1. IESWTR dated December 16, 1998. (This is on the server in each Field Office in PDF format and a full printed copy is also in each Field Office.)
2. EPA manual entitled “Disinfection Profiling and Benchmarking Guidance Manual” dated August 1999. (This is on the server in each Field Office in PDF format and a full printed copy is also in each Field Office.) Waterworks may purchase a copy of this manual from NTIS by calling 1-800-553-6847.
3. A copy of a spreadsheet entitled “CTCalUtah.xls” developed by the Utah Health Department to allow waterworks to calculate and report the CT values on a daily basis. (This is on the server in each Field Office and can only be read by Excel 97 or later).

A. APPLICABILITY DETERMINATION

The flow chart in Appendix A-1 may be used to determine applicability. Applicability will be based on the annual average of TTHM and HAA5 monitoring data for one year. The testing should have begun during the second calendar quarter of 1999, ending the first calendar quarter of 2000. If TTHM/HAA5 data has not been submitted by April 1, 2000, the waterworks is required to begin disinfection profiling continuing until results either confirm that they need to continue or may stop.

1. ICR Waterworks

Waterworks with Information Collection Rule (ICR) data must use the last four quarters of TTHM and HAA5 monitoring data, unless the State determines an alternative data set is more representative. If alternative data is used, existing TTHM monitoring plans shall be used to collect paired samples. The TTHM and HAA5 samples must be collected at the same time and analyzed by the approved methods. The approved analysis methods are listed in Section B. "TTHM and HAA5 Data Requirements".

2. Non-ICR Waterworks

Unless the waterworks chooses to go directly to the profiling requirement, the non-ICR waterworks must submit one year's monitoring data for TTHM and HAA5 collected between April 1999 and March 2000. The samples must be collected from approved TTHM sites from the existing monitoring plans. The TTHM and HAA5 samples must be collected at the same time and analyzed by approved methods. The approved analysis methods are listed in the Section B "TTHM and HAA5 Data Requirements"

3. Non ICR Waterworks With Existing Data

Non-ICR waterworks that have existing TTHM and HAA5 monitoring data may submit that data for applicability determination. However, the data collection and analysis methods must be the same as described in the above sections.

4. Waterworks With No TTHM and HAA5 Data

A waterworks may skip the TTHM and HAA5 monitoring if it decides to go directly to the profiling requirement. This would be the case if the waterworks has already determined that their waterworks can not meet either one or both of the TTHM and HAA5 trigger levels defined in the next section.

B. TTHM and HAA5 DATA

1. TTHM and HAA5 Trigger Levels

Annual Average TTHM ≥0.064 mg/l

Annual Average HAA5 ≥0.048 mg/l

2. TTHM and HAA5 Data Sampling and Analyses Requirements

The example form in Appendix B-1 may be used to review the TTHM and HAA5 monitoring data. The intent of the review would be to ensure the sample collection and analysis meets the requirements of the IESWTR, and to determine if the waterworks is required to create a disinfection profile. For non-ICR data, the sample sites must be the same as listed in the existing TTHM sample siting plans. The analytical requirements are listed in the following table:

	EPA Methods	Standard Methods
TTHM	502.2, 524.2, 551.1	None
HAA5*	552.1, 552.2	6251 B

*Note: The analysis of the HAA5 under the profiling requirement requires use of approved methods, but does not require laboratory certification.

3. Notify the Waterworks that Profiling Is Not Required

If OWP determines the HAA5 and TTHM data is acceptable and the annual average TTHM is <0.064 mg/l and annual average HAA5 is <0.048 mg/l, OWP will notify the waterworks that profiling is not required. Appendix B-2 is an example letter to notify the waterworks.

4. Notify The Waterworks that Profiling is Required

If the annual average TTHM is ≥0.064 mg/l or the annual average HAA5 is ≥0.048 mg/l, or the data is not adequate, or no data is submitted, OWP must notify the waterworks to begin monitoring to create a disinfection profile. If the data is not complete, the waterworks shall continue to profile until a complete data set is received and evaluated. Only after the annual average data is determined to be less than the trigger levels should the waterworks be notified that they may discontinue disinfection profiling. Appendix B-3 is an example letter for notifying the waterworks.

C. DISINFECTION PROFILING

1. Definition

A disinfection profile is a summary of daily *Giardia* inactivation through the treatment plant based on the peak hourly flow through the treatment plant.

2. Quantity and Quality of Required Profiling Data

A one-year profile is required if plant operational data is collected beginning April 1, 2000. A three-year profile is required if existing plant operational data is utilized. The following three options provide details of the required operational data.

Option 1

Waterworks must conduct daily monitoring of pH, temperature and disinfectant residual during peak hourly flow for 12 months (beginning April 1, 2000 and ending March 31, 2001) to calculate daily logs of *Giardia* inactivation and create a one-year profile. The number of points to be monitored will depend on the number of disinfection segments in the treatment plant. A disinfection segment consists of one disinfectant addition point, contact tank or tanks, and one disinfectant residual monitoring point. Acceptable methods for measurement and analysis are the same as required by the Surface Water Treatment Rule (SWTR) and the *Waterworks Regulations*. These methods are listed in Table 3-1 of the "Disinfection Profiling and Benchmarking Guidance Manual."

Option 2

In addition to the monitoring conducted in Option 1, the waterworks may use one to two years of existing data to develop a two to three year profile (optional). The additional data (if used) must also meet the same requirements of sample collection and analysis methods as in Option 1.

Option 3

Waterworks with three years of existing data may use that data to create a disinfection profile. The existing data must meet the same requirements for sample collection and analysis as Option 1. The waterworks must begin monitoring April 1, 2000 and continue until OWP notifies

the waterworks that the submitted data and profile are acceptable and monitoring may be terminated. Appendix B-4 has example letter for notifying the waterworks of DWSE's decision.

3. CREATING A PROFILE

All waterworks that fail to meet the TTHM and HAA5 criteria during applicability determination are required to profile for *Giardia*. Profiling for viruses is not required unless waterworks make significant changes to primary disinfection practices. Waterworks currently using chlorine and continuing to use chlorine after the changes are not required to profile for viruses. Waterworks currently using or planning to use chlorine dioxide, chloramines or ozone for primary disinfection, will be required to create a profile for disinfection of viruses.

Creation of a profile by hand calculation may be tedious and time consuming. An Excel spreadsheet named CTCalUtah.xls is available on the server in each Field Office and may be given to waterworks owners for their use. If any waterworks submits profiling data, our review will include verifying waterworks calculations. A procedure to perform these calculations is outlined in the following steps. Please refer to the EPA "Disinfection Profiling and Benchmarking Guidance Manual" for details.

Step 1

For multiple points of disinfectant application, the treatment plant is divided into disinfection segments. Depending on points of disinfectant addition and residual monitoring, a waterworks will have one or more disinfection segments. Raw water pipe, rapid mix tanks, flocculation tanks, sedimentation basins, filters, plant storage tanks and finished water pipe may be combined to form one or more segments. An example of disinfection segments is shown in Figure 3-5 of the "Disinfection Profiling and Benchmarking Guidance Manual." Steps 2 through 5 are followed for each segment to calculate actual CT provided by each segment.

Step 2

Calculate the volume of each unit process in the segment. Based on the flow regime in the unit process, select an appropriate baffling factor (T_{10}/TDT) and compute effective volume by multiplying total volume by the baffling factor. Compute contact time for the unit process by dividing effective volume by peak hourly flow (gpm). The sum of all the unit process contact times in the segment provides total segment contact time (T).

Note: "Disinfection Profiling and Benchmarking Guidance Manual" (Table 3-7) filtration volume calculations has an error. The volume of filter media is calculated by multiplying by porosity. The correct factor should be (1-porosity).

Step 3

During peak hourly flow, monitor water temperature (^{o}C), pH (for chlorine only) and residual disinfectant concentration for the segment. The acceptable analysis methods are listed in table 3-1 of the "Disinfection Profiling and Benchmarking Guidance Manual." Use this pH, temperature and residual to select an appropriate CT table from the tables in Appendix C of the guidance manual. If the actual temperature and pH falls between the tables, it is recommended the previous table with lower temperature and the next sub-table with higher pH be used. However, interpolation is acceptable. From the selected table or tables, locate the CT required for 3 Log Giardia inactivation.

Step 4

Multiply the disinfectant residual for the segment by the contact time (from step 2) to compute the actual CT provided by the Segment.

Step 5

Compute the ratio of actual CT (from Step 4) and required CT (from step 3), and multiply by 3. This gives the logs of inactivation of Giardia by the segment.

Step 6

Compute the summation of logs of inactivation for all the segments. The result is the daily logs of Giardia inactivation by chemical disinfection for that day. The "Disinfection Profiling and Benchmarking Guidance Manual" has examples of profiling calculations at Page Nos. 3-27 through 3-39. If required, the logs of viruses inactivation can be calculated following the same procedure and using appropriate CT tables.

D. RECORDING AND PRESENTATION OF DATA

The rule requires the profiling data be stored in spreadsheet format and presented in a graphical form.

Use of Profiling Data

The rule does not require state approval of the profiling data or approval of the profile created by one year current monitoring. However, the rule requires the profile be made available to the State during sanitary surveys. Also, the rule requires disinfection benchmark(s) be calculated and discussed with the State, prior to making any modifications to the primary disinfection practices.

E. DISINFECTION BENCHMARKING

1. Definition

The disinfection benchmark for waterworks using only chlorine for primary disinfection is the lowest average monthly logs of Giardia inactivation during the one-year profiling period. For a three-year profiling period, the benchmark is the average of the lowest monthly averages for the three years. For waterworks using chlorine dioxide, chloramines or ozone, the disinfection benchmarks are the lowest average monthly logs of inactivation of *Giardia* and viruses (both).

2. Applicability

See Appendix A-1. Only waterworks planning to significantly modify their primary disinfection practices are required to calculate disinfection benchmark(s).

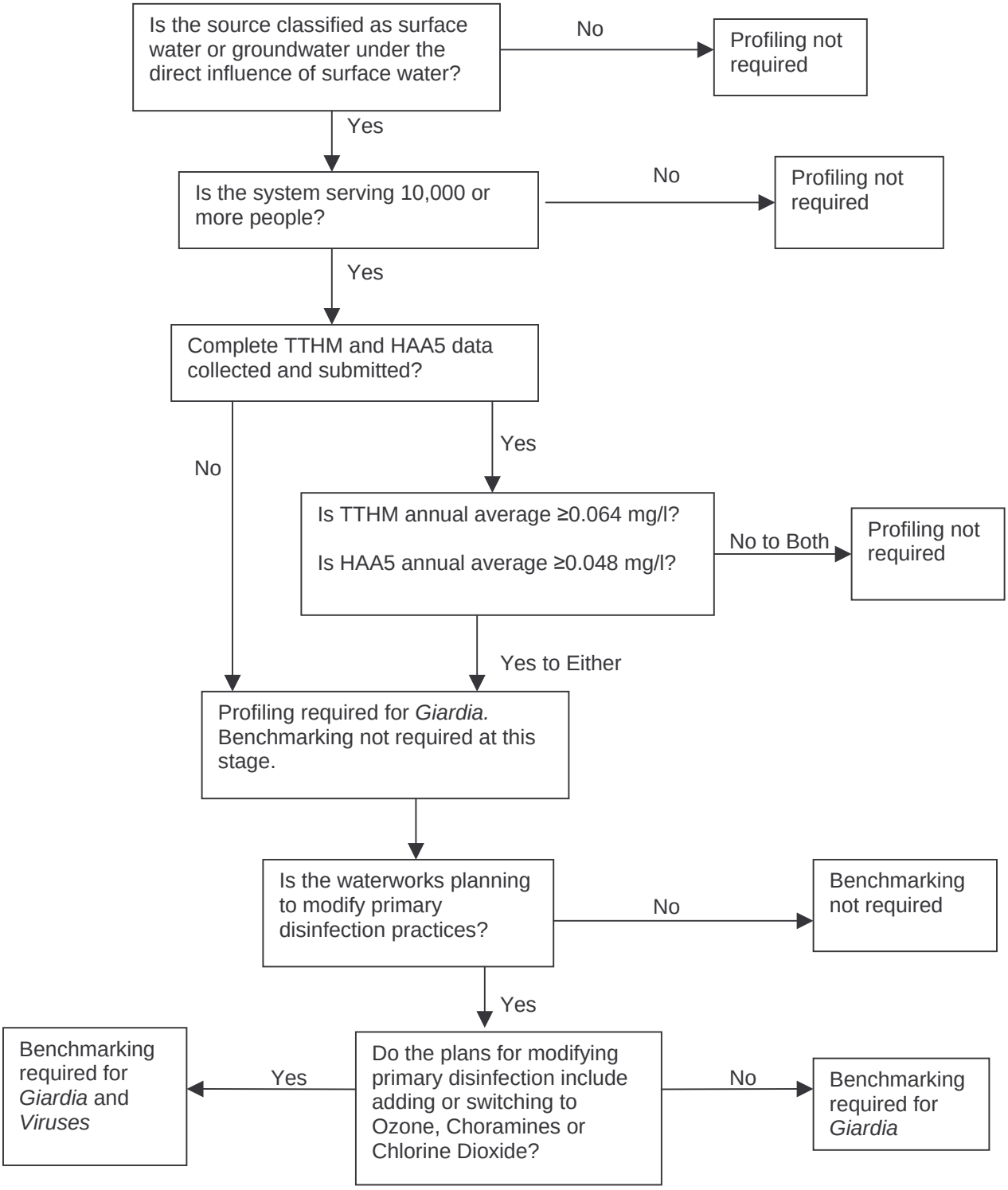
3. Calculating Benchmark

Calculate each calendar month's average logs of inactivation of *Giardia* and viruses (if applicable) from the profiling data. The lowest monthly average is the benchmark. Waterworks planning to make changes, and using disinfectants other than chlorine, will have two benchmarks (one for *Giardia* and one for viruses). An example graphical presentation of the *Giardia* benchmark is shown on Page 3-48 of the "Disinfection Profiling and Benchmarking Guidance Manual," and benchmarks for *Giardia* and viruses (both) are shown on Pages 3-50 and 51.

4. Alternative Benchmark

The benchmark is not an enforceable level of disinfection. However, a waterworks with a disinfection profile (*Giardia*) or profiles (*Giardia* and viruses) must consult with the State before making significant changes to its disinfection practices. During this consultation, alternative benchmark or benchmarks are established by the state. **The plan for establishing alternative benchmarks will be addressed either by this MDBP team or another team in the future.**

APPENDIX A-1


Is the source classified as surface water or groundwater under the direct influence of surface water?
No
Profiling not required
Yes
Is the system serving 10,000 or more people?
No
Profiling not required
Yes
Complete TTHM and HAA5 data collected and submitted?
No
Yes
Is TTHM annual average ≥0.064 mg/l?
Is HAA5 annual average ≥0.048 mg/l?
No to Both
Profiling not required
Yes to Either
Profiling required for *Giardia.* Benchmarking not required at this stage.
Is the waterworks planning to modify primary disinfection practices?
No
Benchmarking not required
Yes
Do the plans for modifying primary disinfection include adding or switching to Ozone, Choramines or Chlorine Dioxide?
Yes
Benchmarking required for *Giardia* and *Viruses*
No
Benchmarking required for *Giardia*

APPENDIX B-1

TTHM AND HAA5 DATA REVIEW FORM

CITY/COUNTY_____

Waterworks _____

Data Calculations:

Quarter	TTHM (Average) mg/l	HAA5 (Average) mg/l
1)		
2)		
3)		
4)		
Annual Average(mg/l)		

Step 1

A) Is TTHM annual average ≥ 0.064 mg/l (round to the significant digits)? Yes/No

B) Is HAA5 annual average ≥ 0.048 mg/l (round to the significant digits)? Yes/No

If you answered "Yes" to either question A or B, notify the waterworks to create a disinfection profile using example letter in Appendix B-3. If you answered No to both questions, go to Steps 2-4 to check quality of the TTHM and HAA5 data.

Step 2

A) Is the data ICR-monitoring data? Yes/No/NA

B) Has EPA validated this ICR data? Yes/No/NA

If you answered "Yes" to both A and B, the data is acceptable and go to Step 4. If you answered No to either of the questions, go to Step 3.

Step 3

A) Does the waterworks have an approved sample siting plan for TTHM monitoring? Yes/No

B) Did the waterworks use approved sample sites for sampling? Yes/No

C) Did the waterworks collect TTHM and HAA5 samples at the same time? Yes/No

D) Were the samples analyzed using approved methods? Yes/No

If you answered Yes to all the questions and the waterworks is a Non-ICR waterworks, the data is acceptable. Go to Step 4.

If the waterworks is an ICR waterworks, explain below why non-ICR data was used:

If the alternative data is justified, go to Step 4.

If you answered No to any of the questions A through D, the data is not acceptable. Notify the waterworks to begin profiling by using example letter in Appendix B-3

Step 4

Is the waterworks required to profile (From Step 1)? Yes/No

If "Yes", notify the waterworks to profile (use example letter in Appendix B-3). If No, notify the waterworks that profiling is not required (use example letter in Appendix B-2),

APPENDIX B-2

SUBJECT:
Water –
PWSID –

Mr./Ms. (waterworks owner)
Waterworks Name
Waterworks Address

Dear Mr./Ms.:

(**NON ICR WATERWORKS**) Attached are four consecutive quarters of TTHM and HAA5 occurrence data collected by the subject waterworks during the monitoring period of April 1999 through March 2000.

OR

(**ICR WATERWORKS SUBMITTING ALTERNATIVE DATA)** Attached are four consecutive quarters of TTHM and HAA5 occurrence data collected by the subject waterworks during the April 1999 through March 2000 monitoring period. These data were submitted as being more representative than the ICR occurrence data.

OR

(ICR WATERWORKS SUBMITTING ICR DATA) Attached are the last four consecutive quarters of TTHM and HAA5 occurrence data collected by the subject waterworks under the Information Collection Rule (ICR).

This Department has reviewed the TTHM and HAA5 data and found them to be in substantial compliance with the Interim Enhanced Surface Water Treatment Rule published on December 16, 1998 and effective February 16, 1999.

The annual average of TTHM is less than 0.064 mg/l and the annual average of HAA5 is less than 0.048 mg/l. Therefore, the Disinfection Profiling requirement of the IESWTR is not applicable to your waterworks.

If you have any questions, please call.

Sincerely,

Name
District Engineer
Office of Water Programs

cc: VDH - DWSE
Local Health Department
Others

APPENDIX B-3

SUBJECT:
Water-
PWSID-

Mr./Ms. (waterworks owner)
Waterworks Name
Waterworks Address

Dear Mr./Ms.:

(**USE THIS PARAGRAPH IF APPLICABILITY DATA IS DISAPPROVED OR IS UNAVAILABLE**) Your waterworks has not submitted (TTHM and HAA5 OCCURRENCE DATA) (ACCEPTABLE TTHM AND HAA5 OCCURRENCE DATA) to determine the applicability of disinfection profiling requirement of the Interim Enhanced Surface Water Treatment Rule (IESWTR). Therefore (YOUR WATERWORS)(THE WATER TREATMENT PLANT THAT TREATS WATER FOR YOUR WATERWORKS) is required to create a disinfection profile.

OR

(USE THIS PARAGRAPH IF ACCEPTABLE TTHM AND HAA5 DATA IS AVAILABLE) Attached are the results of the four consecutive quarters of TTHM and HAA5 occurrence data collected under the Interim Enhanced Surface Water Treatment Rule (IESWTR) for the period of April 1, 2000 through March, 31, 2001. This Department has reviewed this data and has determined the annual average of the TTHM samples is ____ mg/l and the annual average of the HAA5 samples is _____ mg/l. The IESWTR requires that a disinfection profile must be created, if the annual average of TTHM is ≥ 0.064 mg/l, or the annual average HAA5 is ≥ 0.048 mg/l. Therefore, (YOUR WATERWORKS) (THE WATER TREATMENT PLANT THAT TREATS WATER FOR YOUR WATERWORKS) must create a disinfection profile.

To create a one-year disinfection profile, (YOUR WATERWORKS)(THE WATER TREATMENT PLANT THAT TREATS WATER FOR YOUR WATERWORKS) must start operational monitoring by April 1, 2000. (YOUR WATERWORKS)(THE WATER TREATMENT PLANT THAT TREATS WATER FOR YOUR WATERWORKS) may submit three years of existing operational monitoring data and profile for review and approval. However, (YOUR WATERWORKS)(THE WATER TREATMENT PLANT THAT TREATS WATER FOR YOUR WATERWORKS) must continue monitoring while this office reviews the existing data in accordance with the requirements of the IESWTR.

If you have any questions, please call.

Sincerely,

District Engineer
Office of Water Programs

Cc: VDH - DWSE
Water Treatment Plant Owner (If consecutive waterworks)
Local Health Department
Others

APPENDIX B-4

SUBJECT:
Water –
PWSID –

Mr./Ms. (waterworks owner)
Waterworks Name
Waterworks Address

Dear Mr./Ms.:

Attached are the existing operational data and disinfection profiles that you submitted for the subject waterworks.

(USE THIS PARAGRAPH, IF OWP IS APPROVING EXISTING PROFILING DATA AND PROFILE) This Department has reviewed the data and the disinfection profile(s) and has determined them to be in substantial compliance with the Interim Enhanced Surface Water Treatment Rule published on December 16, 1998, and effective February 16, 1999. Therefore, (YOUR WATERWORKS) OR (THE WATER TREATMENT PLANT THAT TREATS YOUR WATER) may now terminate operational monitoring that began on April 1, 2000, to collect one-year data for creating a disinfection profile.

OR

(**USE THIS PARAGRAPH, IF OWP IS DISAPPROVING EXISTING PROFILING DATA AND PROFILE)** This Department has reviewed the data and the disinfection profile(s) and has found the submitted data (profile) does not meet the requirements of the Interim Enhanced Surface Water Treatment Rule published on December 16, 1998, and effective February 16, 1999. Therefore, (YOUR WATERWORKS) OR (THE WATER TREATMENT PLANT THAT TREATS YOUR WATER) must continue the operational monitoring that began on April 1, 2000, to collect one-year data for creating a disinfection profile.

If you have any questions, please call me.

Sincerely,

Name
District Engineer
Office of Water Programs

cc: VDH - DWSE
Water Treatment Plant Owner (if writing to consecutive waterworks)
Local Health Department
Others